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(54) High Reflectance Light Guide

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(57) 16 Claims

Canada

HIGH REFLECTANCE LIGHT GUIDE

TECHNICAL FIELD

The invention relates to light reflectors and particularly to light reflectors used in light guides. More particularly the invention is concerned with a light guide having a reflective surface formed from multiple layers of material and air.

BACKGROUND ART

It is known in the prior art to produce light at a source and then transport the light by a light guide to a distant location where the light is used. Light guides generally have the form of a hollow structure with a reflective surface formed along an inner wall of the guide. By generating light in the hollow cavity, the light is transported by reflection along the inner wall. The light is delivered by aiming the guide at the target area, or opening a hole in the wall and reflecting light out to the target area. An example is provided by U.S. patent 4,459,642 to Kei Mori for an Optical Lighting Device. The example shows multiple coaxial tubes having reflective internal surfaces, and numerous openings along the tubes to release the light guided by internal reflections. There are several advantages to distributing light by a light guide. A single efficient source may be used instead of numerous less

CLAIMS

What is claimed is:

1. A light reflector comprising:
A multiplicity of sheets a of a first flexible, and substantially transparent material having a first index of refraction, and a first layer thickness, mutually aligned to be substantially parallel, adjacent and separated one from another by layers of a second flexible, and substantially transparent material having a second index of refraction not equal to the first index of refraction, and a second layer thickness, to form a stack of alternating layers to reflect incident light.

2. The light reflector in claim 1, wherein the number of material layers exceeds two.

3. The light reflector in claim 1, wherein the layers are arranged concentrically about an axis.

4. The light reflector in claim 1, wherein the layers are curved concentrically about an axis.

5. The light reflector in claim 1, wherein the layers are arranged in a circle concentrically about an axis.

6. The light reflector in claim 1, wherein the index of refraction for the first material is greater than 1.3.

7. The light reflector in claim 1, wherein the sheets are a plastic material.

8. The light reflector in claim 7, wherein the sheets are a polyester film material.

9. The light reflector in claim 1, wherein the sheet thickness is about a $6x10^{-3}$ mm to about 0.1 mm.

10. The light reflector in claim 1, wherein the second layer material is a gas.

11. The light reflector in claim 1, wherein the gas is air.

12. The light reflector in claim 10, wherein the first layer material is a plastic material not drawn to a second layer of the same material so as to exclude an intermediate layer of the gas.

13. The light reflector in claim 1, wherein the first layer thickness is approximately equal to the second layer thickness.

14. The light reflector in claim 1, wherein the first layer thickness is greater than a wavelength of the longest wavelength light to be reflected, and less than an absorption depth of 1.0% for the first layer material.

15. A light guide reflector comprising a tube having internally reflective walls enclosing an open central cavity, the wall being composed of multiple layers of transparent plastic film having a single layer thickness less than would absorb one percent of light transiting the layer, and greater than a single wavelength of the transiting light spaced apart by layers of gas having a thickness from approximately a single wavelength of the transiting light to the film thickness.

16. The light reflector in claim 15, wherein the walls have a total thickness of between 10 and 1000 layers of the film material.

17. The light reflector of claim 16 wherein the wall have total thickness of between 25 and 100 layers of the film material.

18. A light guide comprising:
A multiplicity of layers of a substantially transparent, flexible plastic material having a first index of refraction, and a first sheet thickness, arranged in a curved form concentrically about an axis to define an enclosed cavity, and mutually aligned to be parallel, adjacent and separated one from another by layers of a gas having a second index of refraction, and the second layer thickness being approximately equal to the first layer thickness thereby forming a stack of alternating layers of to reflect light in the defined cavity.

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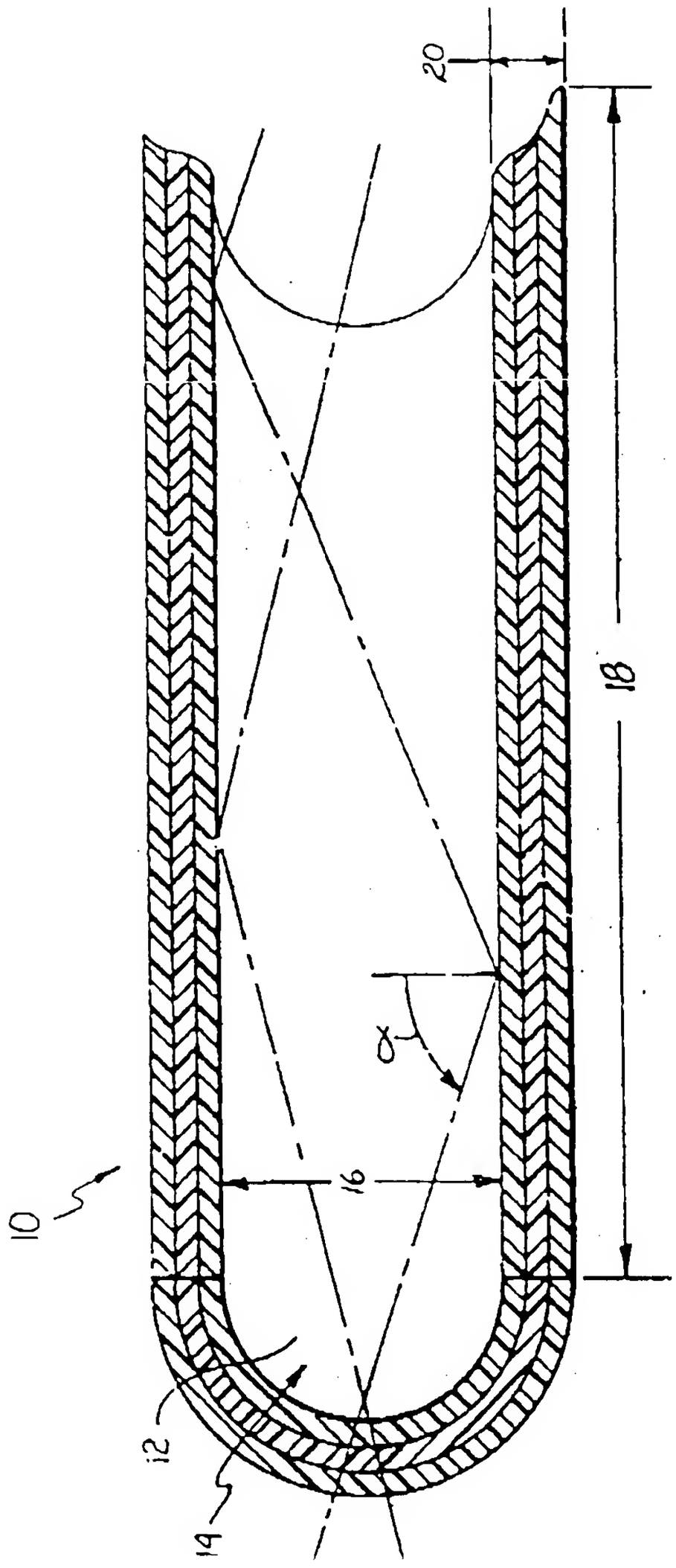

FIG. 1

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